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Reply to Office action of November 3, 2005

18. (Original) The method of claim 17 further comprising the step of measuring the time elapsed following a vehicle start and maintaining the power level at the first level in response to the measured elapsed time being less than a first predetermined time.

19. (Original) The method of claim 18 further comprising the step of increasing the power level of heater power delivered to the heater rod to the second level in response to the measured elapsed time being greater than a second predetermined time regardless of the measured capacitance or rate of change of capacitance.

20. (New) A method for controlling the heating of an oxygen sensor mounted in an engine of a motor vehicle, the oxygen sensor comprising an oxygen sensing element, a heater, and a surrounding shell, the method comprising the steps of:

measuring capacitance between the oxygen sensing element and the surrounding shell, and

applying power to the heater in response to the measured capacitance.

REMARKS

Claims 1-14 and 17-20 are pending in the application. Claims 8 and 17 have been amended to place them in independent form. New independent claim 20 has been added. Reconsideration of all pending claims is respectfully requested in view of the foregoing amendments and the following remarks. The foregoing amendments and the following remarks are fully responsive to the Office Action mailed November 3, 2005 and are believed to render all pending claims at issue patentably distinct over the cited references. The foregoing amendments are made in the interest of expediting prosecution, and there is no intent to surrender any range of equivalents to which Applicant would otherwise be entitled in view of the prior art.

CLAIM REJECTIONS – 35 USC § 102

Claim 1 was rejected under 35 USC § 102(b) over Samman et al. (6,418,784).

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This rejection is believed to be in error at least because the cited reference fails to disclose or even suggest all of the elements of claim 1. Claim 1 recites, in part, "applying power to a heater of the oxygen sensor in response to the measured capacitance." There is no disclosure or suggestion in the Samman et al. reference to applying power in response to the measured capacitance. The only disclosure concerning the heater is: "Heater 50 may, for example, be used to heat sensor 20' during a cold start." (Column 4, lines 36-37) There is no disclosure that the heater power is applied in response to the measured capacitance of capacitor 38. Accordingly, claim 1 distinguishes over the cited reference.

CLAIM REJECTIONS – 35 USC § 103

Claims 2-5 were rejected under 35 USC § 103(b) as unpatentable over Samman et al. in view of Takami et al. (6,084,418). This rejection is believed to be in error for at least the following reasons. First, Claims 2-5 are dependent, either directly or indirectly, from independent Claim 1. As explained above, Samman et al. fails to disclose or suggest a recited element of Claim 1. The Takami et al. reference does not disclose the recited element missing from the Samman et al. reference. There is no disclosure or suggestion in Takami et al. of measurement of any capacitance value. More importantly, there is no disclosure or suggestion in Takami et al. that the power applied to a heater of an oxygen sensor is in response to a measured capacitance as recited in Claim 1. Claims 2-5 therefore distinguish over the cited combination of references for at least the same reasons as does the independent claim from which they depend.

In addition, Claim 2 specifically recites "measuring the capacitance between an electrode of the oxygen sensor and a shell of the oxygen sensor." Neither of the cited references discloses or suggests such a measurement.

In addition, Claim 3 recites "applying a first level of power to the heater if the capacitance is greater than a first predetermined capacitance value and the rate of change of measured capacitance is greater than a first predetermined rate." Neither Samman et al. nor Takami et al. discloses the measurement of either capacitance or rate of change of capacitance to control the application of power to the sensor, and thus the cited references

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cannot suggest the claimed step of applying a power level based on such a measurement. Claims 4 and 5, each of which depends from claim 3, recite further steps relating to the application of power to the heater of an oxygen sensor based on measurements of capacitance or rate of change of capacitance. Claims 4 and 5 thus distinguish over the combination of Samman et al. and Takami et al. for at least the same reasons claim 3 distinguishes over the combination.

Claim 14 was also rejected under 35 USC § 103(a) as unpatentable over the combination of Samman et al. and Takami et al. This rejection is also believed to be in error for at least the following reasons. Neither reference discloses or suggests the step of "providing a first electrode coupled to the outer electrode and a second electrode coupled to the shell, the first and second electrodes configured to facilitate measurement of capacitance between the outer electrode and the shell during operation of the motor vehicle" as claimed in Claim 14. See FIG. 5 of Takami et al. and the description thereof which discusses the only two capacitances disclosed in the reference. Neither of these two capacitances is the capacitance between the outer electrode and the shell as claimed. Likewise, the capacitance disclosed in Samman et al. is not the capacitance between the shell and the outer electrode. Accordingly, Claim 14 distinguishes over the cited combination of references.

Claims 6 and 7 were rejected under 35 USC § 103(a) in view of Samman et al., Takami et al., and Tomisawa (US 2003/10088). This rejection is also believed to be in error for at least the following reasons. Claims 6 and 7 depend either directly or indirectly from claim 1. Claim 1 distinguishes over the cited Samman et al reference for the reasons given above. Neither the Takami et al. reference nor the Tomisawa reference discloses or suggests the steps of measuring capacitance and applying power to a heater in response to the measured capacitance. The Takami et al. and Tomisawa references thus fail to supply at least this element missing from Samman et al. In addition, although the Tomisawa reference discloses a timer, there is no disclosure or suggestion that the time measured is used to set the power level of a heater in an oxygen sensor. The timer referred to in Tomisawa does not measure time after detecting the starting of the engine (as claimed), but rather measures time "after the above-mentioned judgement." None of the references discloses or suggests applying power at a first power level or a second

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power level (as claimed) in response to measuring an elapsed time after detecting the starting of the engine. Accordingly, claims 6 and 7 distinguish over the cited combination of Samman et al., Takami et al., and Tomisawa.

ALLOWABLE SUBJECT MATTER

Claims 8-13 and 17-19 were indicated to be allowable if rewritten in independent form. Claims 8 and 17 have been rewritten in independent form and thus are believed to be in condition for allowance.

NEW INDEPENDENT CLAIM

New independent claim 20 has been added. Independent claim 20 is believed to distinguish over any of the cited references, taken alone or in any combination, for at least the same reasons as are expressed above with respect to independent claim 1. None of the cited references discloses or suggests controlling the heating of the heater of an oxygen sensor in response to measured capacitance.

CONCLUSION

In view of the foregoing amendments and remarks, it is now believed that claims 1-7 and 14 distinguish over the cited references, either taken alone or in combination, and are in condition for allowance. In addition, Claims 8 and 17 have been amended as suggested by the Examiner so that Claims 8-13 and 17-19 are now also believed to be allowable. New independent Claim 20 is believed to distinguish over the cited references and to also be in condition for allowance. Allowance of Claims 1-14 and 17-20 is therefore earnestly requested.

If for some reason Applicant has not requested a sufficient extension and/or has not paid a sufficient fee for this response and/or for the extension necessary to prevent abandonment on this application, please consider this as a request for an extension for the

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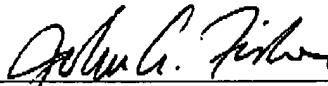
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required time period and/or authorization to charge Deposit Account No. 50-2091 for any fee which may be due.

Respectfully submitted,

GENERAL MOTORS, INC., ASSIGNEE

Dated: 12/22/05

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